

architect and marine engineer. In these sections of the book considerable use is made of information published in the Transactions of the Institution of Naval Architects and other technical publications, always with due acknowledgment.

There are six chapters. The first deals with "stream-lines," mainly following Rankine's methods, but also discussing Prof. Hele Shaw's interesting experiments on viscous stream-line flow and Sir George Stokes's mathematical investigations thereon. Next an excellent summary is given of the theory of wave-motion; for waves of translation and oscillation, and for capillary waves. Methods of observing ocean waves, and some results of such observations, are also described. In this section reference is made to original work done by Prof. Osborne Reynolds in connection with groups of waves.

Two interesting chapters—making up about one-fourth of the book—are devoted to an epitome of modern methods of determining the resistance of ships, due for the most part to the work of William Froude, whose enunciation of the "law of comparison" between ships and models, and investigations of frictional, eddy-making, and wave-making resistance are described in detail. Since the system of model-experiments was introduced by Froude about forty years ago, great extensions have taken place in the trials made with full-sized ships, and the comparisons of the results of such trials with those obtained with model ships and propellers have yielded much valuable information. This result is illustrated in many ways by the author, in a chapter dealing with the trials of ships. Considerable interest will be taken in the discussion of the influence which *depth of water* has upon the resistance of ships, especially in view of certain extraordinary results obtained on the trials of some recent torpedo-boat destroyers. In a final chapter the characteristics and relative efficiencies of water-jet propellers, paddle wheels, and screw propellers are discussed at length, the work of the two Froudes, Rankine, Cotterill, and Charles Parsons being utilised. No part of the book shows greater labour than this in its assemblage and analysis of facts and theories. A good index completes the volume.

On its merits the book deserves, and will receive, favourable recognition from all interested in the subjects of which it treats. That recognition will not be lessened by the fact that its appearance is coincident with a serious breakdown in health of its gifted author, involving his resignation of the professorship of civil and mechanical engineering in the University of Manchester. To this circumstance may be attributed certain errors in mathematical formulæ occurring in the book, and these should be corrected in future editions. There is evidence, too, that the book was, for the most part, completed some time ago; as it gives no account of valuable experimental investigations made during the last two or three years in this country and the United States. As it stands it may be recommended as a text-book for the use of students, working under the guidance of competent teachers.

STUDIES IN THE STATISTICS OF PRODUCTION.

Kraft: Ökonomische, technische und kulturgeschichtliche Studien über die Machtentfaltung der Staaten.

By Prof. E. Reyer. Pp. xvi+380. (Leipzig: W. Engelmann, 1908.) Price 6 marks.

THE subject with which Dr. Reyer deals in this volume is an extremely wide one, viz. "the supply and consumption of human, animal and mechanical and thermal energy for domestic purposes and in agriculture, industry and transport." Practically speaking, the subject, as he interprets it, is coterminous with what is usually understood by the statistics of production, and we cannot help thinking that some such title would have better described the work. Dr. Reyer deals not merely, or even principally, with statistics of power as such, but with the means of obtaining heat and power, the uses to which it is put, and even the organisation of industry. The replacement of handwork by wholesale manufacture, the output of coal, the development in the use of steel, transport by land and sea, agriculture, gas and electric lighting all come under his survey.

The labour that Dr. Reyer must have spent on his work and on the preparation of the numerous illustrative diagrams is immense, and some of his studies serve to emphasise very well the great changes that have taken place of recent years in the industries of the world, and more especially in the relative positions of Germany, Great Britain, and the United States—the three countries to which the author devotes most of his attention. Taking the volume as a whole, however, we do not think that Dr. Reyer can be said to have fulfilled his task very happily, though it will be readily conceded that many difficulties are inherent in the subject. The data are very imperfect, usually incomplete, and nearly always incomparable as between one country and another. Still, there are data, and the volume might, we think, have been made both more readable and more useful to the student.

In the first place, the chapters read as if they were isolated studies, made at different times, and subsequently thrown together with little or no attempt at arrangement. The first three are entitled "The Age of Steel," "Mining and the Importance of Coal," and "The Noble Metals" respectively, and form to some extent a connected series. The reader expects the following chapters to deal with other industries, but chapter iv. treats of the growth of population and development of industry in the case of the Great Powers, chapter v. passes to the industries of a single country—the United States—chapter vi. gives a general discussion on the subject of wholesale manufacture and handwork, and the next chapter deals with economic fluctuations! After this we come to transport and then to agriculture. The book has no obvious structure or plan, and the erratic changes of subject are most distracting to the reader.

In the second place, references are almost entirely lacking. There are few or none in the text, and a hopelessly inadequate bibliography at the end of the volume, a bibliography which suggests that the author must have taken much of his information at second

hand. Data of every degree of untrustworthiness are given in the text, but the student is debarred from verifying the figures or referring to the original for further information as to their meaning; exact references should have been given in every case. Even in the bibliography we would suggest that such citations as "Produktion and consum. of timbre in foreign countries. (blue book)," and "Statesman's yearbook, Statist. Abstracts (mit statistischen Tabellen)," are hardly clear.

Finally, while we approve the use of graphic methods, we wish that Dr. Reyer would lay to heart the golden instruction in the Board of Education's "Syllabus of Practical Mathematics":—"In all the work on squared paper a candidate should be made to understand that an exercise is not completed until the scales and the names of the plotted quantities are clearly indicated on the paper."

OUR BOOK SHELF.

Etude sur la Vallée Lorraine de la Meuse. By J. Vidal de la Blache. Pp. 190; with figures and folding maps. (Paris: Armand Colin, 1908.) Price 4 francs.

CAPTAIN VIDAL DE LA BLACHE publishes in this book a memoir on the development of the valley of the Meuse, a subject that has engaged the attention of several previous authors, including M. Cornet and Prof. W. M. Davis. He points out the striking character of this long valley, without any important tributaries, yet carved out in past times by a river more powerful than that which now occupies its bed. He explains its independence as regards the Paris basin by the fact that its waters were led northward into an old sea covering the Ardennes before the westward slope of the Seine system had been determined. The Meuse was originally joined by the Moselle at Pagny-sur-Meuse, through the now deserted gap between that town and Toul, and thus had its primary sources in the Vosges. The author relies much on the distribution of pebbles from the Vosges in the older alluvium of the valley. He denies that the river is decadent, though since the capture of the Moselle it has lost much of its erosive force; it has still an important flow, owing to the supplies gathered from the rains and stored in the deep and saturated gravels of its bed.

The second part of the book relates to the influence of the valley on the occupations of its inhabitants. The population has become reduced (p. 143) to the lowest level compatible with agricultural production, and labourers are even invited from other areas. Hence there is no surplus of workers who might emigrate from it to the neighbouring mining country. The latter has become occupied by Belgians and Italians, and the contrast of peoples and modes of living has become acute. The typical farmstead on the Meuse is figured on p. 151, where we see dwelling-house, barn, and stable under one great roof, as in Friesland; three separate entries, however, are here provided in place of the huge doorway common in the Low Countries. The history of roads along this natural highway or across it is fairly given, but the author stops short of the last great incident of the valley, when the French armies were led northward along it, as if drawn fatally to the Ardennes, while the Bavarians, representing the ancient torrents from the Vosges, poured down after them to Mouzon and Sedan. As Captain de la Blache ob-

serves (p. 177), the mineral wealth of Lorraine has led to a convergence of canals and railways independent of the direction of the Meuse; it is as if this valley "avait subi aussi une capture économique." G. A. J. C.

Chemical Reagents, their Purity and Tests. A New and Improved Text based on the Latest Edition of Krauch's "Die Prüfung der chemischen Reagentien auf Reinheit." By E. Merck. Translated by H. Schenck. Pp. vii+250. (London: A. Constable and Co., Ltd., 1907.) Price 6s. net.

EVERY chemist, whether engaged in analytical work or not, will welcome the translation of Krauch's manual into English, for the growing refinements introduced into all chemical operations render a full knowledge of the purity of laboratory reagents increasingly important.

In the present volume the properties of common materials, both inorganic and organic, are given in alphabetical order, the nature of the impurities indicated, and the tests, both qualitative and quantitative, described. It thus becomes a very simple matter to ascertain the purity of any substance, and, as there are something like 250 enumerated, it will be seen that the range is fairly comprehensive. There is little that calls for comment or criticism. The descriptions of the impurities and tests, though short, are usually sufficient for the purpose, not the least valuable part being the references to original papers containing details of the processes not found in the text.

The original of Krauch's manual appeared in German in 1888, and passed through several editions, the above translation being made from a revised edition prepared by E. Merck in 1905. The names of the joint authors are a sufficient guarantee of the trustworthiness of the information, and the translation is all that could be desired. Whilst strongly recommending the book we would direct attention to a few omissions. There is no mention of hydrazine, formaldehyde, toluene, or titanium salts, no quantitative method given for estimating solutions of hydrogen sulphide and ammonium sulphide, and nothing is said about metallic lead, magnesium, and aluminium, all of which may be regarded as not uncommon reagents. J. B. C.

Notre Flotte aérienne. By Wilfrid de Fonvielle and Georges Besançon. Pp. 234. (Paris: Gauthier-Villars, 1908.) Price 6.50 francs.

THIS little book forms a *résumé* of the steps taken to accomplish the navigation of the air so far as we have at present got. Ordinary ballooning is left out of the question, and the bulk of the book is devoted to the development of the dirigible, especially in France.

Soon after the ascent of the first balloon (1783), Lieutenant Meusnier wrote a memoir discussing the principles on which a dirigible balloon might be constructed. This was remarkable as foreshadowing the airship of to-day, especially as regards the "ballonet," or method by which the envelope can be kept rigid by the internal pressure of air. But at that period no engines existed by which the necessary power for propulsion could be obtained. Later on, when the steam engine had become developed, Giffard built his machine, the prototype of the modern vessel, and made trials in Paris in 1852. Little by little further improvements were made, the siege of Paris especially directing attention to the importance which might attach to such an apparatus in military operations.

Then came the electrically propelled balloons of MM. Tissandier, and *La France*, which latter proved to be the first machine to make long journeys successfully.